Synthetic Organic Compounds

Water and bottom-material samples collected at the 13 study sites were analyzed for VOC's (water only), ABN's, and polychlorinated biphenyls (PCB's) (table 1). No VOC's, ABN's, or PCB's were detected in any of the samples analyzed. The absence of these synthetic organic compounds in concentrations above detection levels (table 8) indicates that streams in the basin are not substantially affected by industrial wastes containing these synthetic organic compounds.

Few pesticides were detected during the September 1989 study period. One or more of the insecticides diazinon and parathion, or the herbicide 2,4-D were detected in low concentrations in water samples collected at sites 2, 3, and 6-9 (table 9). Diazinon and parathion are in the class of insecticides known as organophosphorus compounds. The toxicity of organophosphorus compounds varies widely, and generally is associated with the inactivation of acetylcholinesterase, an enzyme that catalyzes the hydrolysis of acetylcholine (Aldridge and Davison, 1952). Diazinon, which is considered to be relatively safe (Fishbein, 1976), was detected at sites 2, 7, and 8. Parathion, which is considered to be highly toxic (Fukuto, 1987), was detected at site 2, however, the concentration of parathion detected in the water sample collected at this site (0.01 µg/L) was slightly less than the level designated by the USEPA as having chronic adverse effects on freshwater fish (table 2). Low concentrations (less than 0.3 µg/L) of the broad-spectrum herbicide 2,4-D were detected in water samples collected at six sites (2, 3, and 6-9) in September 1989. The major use of 2,4-D is to control broadleaf weeds, particularly in cereal crops. The compound acts as a synthetic plant-growth regulator, overstimulating young cells and preventing normal differentiation and maturation (Mullison, 1987). No insecticides were detected in bottom material.

According to the Louisiana State University Cooperative Extension Service, propanil, molinate, and thiobencarb are the principal herbicides currently being applied to rice and soybeans in the Mermentau River basin (Dearl Sanders, Louisiana State University Cooperative Extension Service, oral commun., 1989). Propanil belongs to the class of herbicides called acid amides and acts by interfering with photosynthesis. Propanil is used on most of the rice grown in the United States (Jordan and Cudney, 1987). In general, persistence of acid amides in soil is relatively short, 4-12 weeks; however, acid amides may persist for as long as 9 months under some soil conditions (Jordan and Cudney, 1987). Molinate is a thiocarbamate and is a pre-emergence herbicide active on grasses, particularly barnyardgrass. Thiobencarb is a carbanothiolate. These three widely used herbicides were not detected in samples collected in September near the end of the growing season. However, these and other herbicides were detected in samples collected at sites 1-3, 5-8, 10, and 12 during May 16-17, 1990 (fig. 7). Aerial application of pesticides (primarily herbicides) was in progress during the May 1990 sampling. Results indicated concentrations of propanil, molinate, and thiobencarb in water ranging from about 0.1 to 12 µg/L (fig. 7). Atrazine, a triazine herbicide, was detected in water in concentrations ranging from about 0.1 to 4.7 µg/L at eight of the nine sites sampled in May 1990. Because the herbicides were detected in water during the spring when herbicide usage is heaviest, but were not detected in the late summer, it seems that these compounds either degraded or were otherwise removed from the Mermentau River basin in less than 4 months.

Fecal Bacteria

Water samples were collected for analysis of fecal-coliform and fecal-streptococcus bacteria at all sites (fig. 8). Results of these bacteriological analyses indicated relatively high concentrations of fecal-coliform bacteria at sites 1-4. Site 2 had the highest concentrations of fecal-coliform bacteria, greater than 50,000 cols/100 mL. The concentration at this site indicated a nearby, direct input of sewage. Sewage might also be the source of the elevated concentrations of fecal and fecal-streptococcus bacteria at sites 1, 3, and 4. Apparently, most of the bacteria die off before arriving at the lower reaches of the river, as the fecal-coliform concentrations are much lower in the downstream reaches of the tributaries and the main stem of the Mermentau River.

Fecal-bacteria concentrations were analyzed only in the samples collected during September 1989, a period of less than average rainfall. Bacteria concentrations at these sites might be substantially different during periods of rainfall. The intense but relatively brief thunderstorms typical of south Louisiana during the summer could produce peaks of very high fecal-bacteria concentrations (the "first flush" effect) during the initial rise of these streams. The sources of these high concentrations are overland runoff from pastures and discharges from overwhelmed sewage treatment facilities. However, sustained periods of rain typical of the winter months will likely result in dilution and resultant low fecal-coliform concentrations. Therefore, analyses of fecal bacteria in water samples collected at a single time and place can provide useful information, but cannot be used to describe the extent of contamination in a stream.

Tests for the presence of gram-negative enteric bacteria were conducted on samples collected in September 1989 at all 13 sites. These tests failed to detect any pathogenic bacteria, except at site 1 (Bayou Queue de Tortue) where *Salmonella* probably was present. These tests are not quantitative; they can only indicate the presence or absence of enteric bacteria.

SUMMARY AND CONCLUSIONS

An intensive water-quality investigation was conducted at 13 sites in the Mermentau River basin during September 15-27, 1989. Selected sites were resampled for analysis of herbicides during May 16-17, 1990, during the season of herbicide application. Constituents analyzed included major ions, nutrients, trace elements, synthetic organic compounds, and fecal bacteria.

Specific conductance and concentrations of major ions in water at sites in the basin indicate a predominantly freshwater system although the most downstream reach of the Mermentau River was affected by tides. Water temperature and specific conductance were monitored hourly at six sites, pH at five sites, and DO at four sites. Twenty-four hour variations in DO concentration typical of lakes were noted at many sites probably because of photosynthetic activity.

Concentrations of nutrients in water in streams in the basin were typical of concentrations in many coastal Louisiana streams. Nutrient concentrations were relatively high in Bayou Plaquemine at Highway 370 where the dissolved phosphorus concentration was 1.70 mg/L, the dissolved ammonia concentration was 3.80 mg/L, and the dissolved nitrate concentration was 0.22 mg/L. The high nutrient concentrations, specific conductance (551 µS/cm), BOD (6.0 mg/L), and fecal-coliform concentration (greater than 50,000 cols/100 mL) at Bayou Plaquemine at Highway 370, indicated that the stream probably received untreated sewage input and possibly runoff containing agricultural fertilizer. Nutrient concentrations decreased downstream from Bayou Plaquemine at Highway 370.

Trace-element analyses in water indicated little contamination of streams and lakes in the basin. Bottom material was analyzed for trace-element concentrations and for the physical and chemical factors (organic matter, grain size, oxide coatings) that affect them. The concentrations of trace elements in streams in the basin were compared to predicted concentrations computed using a national data base of 61 uncontaminated bottom-material samples to indicate possible low-level contamination. Arsenic concentrations in bottom material at Bayou des Cannes southeast of Basile and mercury concentrations in bottom material at Mermentau River at Mermentau were significantly larger than predicted values.

Volatile organic compounds were not detected in water during the study period. Acid-base/neutral extractable organic compounds and PCB's also were not detected in water or bottom material at any of the sites. The absence of these compounds at detection levels indicates that the basin is relatively unaffected by those synthetic organic compounds that are commonly used as indicators of industrial activity.

Water and bottom-material samples were analyzed for insecticides, and water samples were analyzed for herbicides at all 13 sites. Samples were analyzed for a variety of pesticides including those commonly used on rice and soybeans, such as the herbicides molinate, propanil, thiobencarb, and the triazines. Low concentrations of 2,4-D were detected in water at six sites, low concentrations of diazinon at three sites, and a low concentration of parathion at one site. No insecticides were detected in the bottom material. None of the herbicides commonly used specifically on rice and soybeans were detected in September 1989. However, nine of the sites were resampled in May 1990 during the season of herbicide application. Propanil (0.12 to 0.78 µg/L) was detected in water at seven of the nine sites atrazine (0.13 to 4.7 µg/L) at eight of nine sites, and thiobencarb (0.17 to 1.5 µg/L) at all nine sites.

Fecal-bacteria concentrations were relatively high (greater than 100 cols/100 mL) at the upper parts of Bayous Queue de Tortue, Plaquemine, and des Cannes, and lower downstream. Bacteria concentrations in excess of 50,000 cols/100 mL were detected at Bayou Plaquemine at Highway 370, and probably indicate nearby sewage inputs. Tests for the presence of enteric pathogens indicated that *Salmonella* might have been present in water at Bayou Queue de Tortue at Highway 13, but no pathogens were detected at the other sites.

Table 8. Detection limits for synthetic organic compounds analyzed in water and bottom material
[Environmental Protection Agency analytical methods 624 (volatiles) and 625 (semivolatiles); level of detection in water is in micrograms per liter; level of detection in bottom material is in micrograms per kilogram; NA, not analyzed]

Compound	Detection limit: Water	Detection limit: Bottom material	Compound	Detection limit: Water	Detection limit: Bottom material
Volatile organic compounds in water					
Benzene	0.2	NA	Trichlorofluoromethane	0.2	NA
Bromoform	.2	NA	1,1-Dichloroethylene	.2	NA
Carbon tetrachloride	.2	NA	1,2-Dibromoethylene	.2	NA
Chlorobenzene	.2	NA	1,1,2-Trichloroethane	.2	NA
Chloroethane	.2	NA	1,1,2,2-Tetrachloroethane	.2	NA
Chloromethane	.2	NA	Dichlorodifluoromethane	.2	NA
Dibromochloromethane	.2	NA	1,2-Dichloroethane	.2	NA
1,1-Dichloroethane	.2	NA	1,2-Dichloropropane	.2	NA
Ethylbenzene	.2	NA	1,3-Dichloropropene	.2	NA
Methyl bromide	.2	NA	1,2-Transdichloroethylene	.2	NA
1,1,1-Trichloroethane	.2	NA	2-Chloroethyl vinyl ether	.2	NA
Chloroform	.2	NA	1,2-Dichlorobenzene	.2	NA
Methylene chloride	.2	NA	Dichlorobromomethane	.2	NA
Styrene	.2	NA	Cis-1,3-Dichloropropene	.2	NA
Tetrachloroethylene	.2	NA	Trans-1,3-Dichloropropene	.2	NA
Toluene	.2	NA	1,3-Dichlorobenzene	.2	NA
Trichloroethylene	.2	NA	Vinyl chloride	.2	NA
Acid-base/neutral extractable (semivolatile) organic compounds					
Acenaphthene	5.0	250	4-Chloro-3-methylphenol	30.0	1,500
Acenaphthylene	5.0	250	Chysene	10.0	500
Anthracene	5.0	250	Di-n-Butyl phthalate	5.0	250
Benzo(a)anthracene			Di-n-Octyl phthalate	10.0	500
1,2-Benzanthracene	5.0	250	Diethyl phthalate	5.0	250
Benzo(a)pyrene	10.0	500	Dimethyl phthalate	5.0	250
Benzo(b)fluoranthene	10.0	500	4,6-Dinitro-2-methylphenol	30.0	1,500
Benzo(ghi)perylene	10.0	500	Fluoranthene	5.0	250
Benzo(k)fluoranthene	10.0	500	Fluorene	5.0	250
Butyl benzyl phthalate	5.0	250	Hexachlorobenzene	5.0	250
Hexachlorobutadiene	5.0	250	1,4-Dichlorobenzene	5.0	250
Hexachlorocyclopentadiene	5.0	250	Bis(2-chloroethoxy)methane	5.0	250
Hexachloroethane	5.0	250	Bis(2-chloroethyl)ether	5.0	250
Indeno(1,2,3-CD)pyrene	10.0	500	Bis(2-ethylhexyl)phthalate	5.0	250
Naphthalene	5.0	250	2-Nitrophenol	5.0	250
Nitrobenzene	5.0	250	2,4-Dichlorophenol	5.0	250
N-nitrosodimethylamine	5.0	250	2,4-Dimethylphenol	5.0	250
Phenanthrene	5.0	250	2,4-Dinitrophenol	20.0	1,000
Pentachlorophenol	5.0	1,500	2,4-Dinitrotoluene	5.0	250
Phenol	5.0	250	2,4,6-Trichlorophenol	20.0	1,000
Pyrene	5.0	250	2,6-Dinitrotoluene	5.0	250
1,2-Dichlorobenzene	5.0	250	4-Bromophenyl phenyl ether	5.0	250
1,2,4-Trichlorobenzene	5.0	250	4-Chlorophenyl phenyl ether	5.0	250
1,3-Dichlorobenzene	5.0	250	4-Nitrophenol	30.0	1,500
Isophorone	5.0	250	2-Chloronaphthalene	5.0	250
N-nitrosodi-N-propylamine	5.0	250	2-Chlorophenol	5.0	250
Pesticides					
2,4-DP	0.10	NA	P'P"DDE	0.01	10
2,4-D	.10	NA	O'P"DDE	.01	10
2,4,5-TP	.10	NA	P'P"DDD	.01	10
2,4,5-T	.10	NA	O'P"DDD	.01	10
Atrazine	.10	NA	P'P"DDT	.01	10
Propanil	.10	NA	O'P"DDT	.01	10
Molinate	.10	NA	Mirex	.01	10
Thiobencarb	.10	NA	beta-Endosulfan	.01	10
Promotryne	.10	NA	Diazinon	.01	10
Prometone	.10	NA	Methoxychlor	.01	10
Propazine	.10	NA	Ethion	.01	10
Simazine	.10	NA	Malathion	.01	10
Simetryne	.10	NA	Perthane	.01	10
Alachlor	.10	NA	Methyl Parathion	.01	10
Metolachlor	.10	NA	Parathion	.01	10
Metribuzin	.10	NA	Trithion	.01	10
Trifluralin	.10	NA	Methyl Trithion	.01	10
Ametryne	.10	NA	Chlordane	.01	10
Cyanazine	.10	NA	Aldrin	.01	10
Endrin	.01	10	gamma-BHC	.01	10
Heptachlor	.01	10	Dieldrin	.10	10
Heptachlor epoxide	.01	10	Toxaphene	.50	500
Alpha Endosulfan	.01	10			
Polychlorinated Biphenyls (PCB's)					
PCB-1016	0.10	100	PCB-1248	0.10	100
PCB-1221	.10	100	PCB-1254	.10	100
PCB-1232	.10	100	PCB-1260	.10	100
PCB-1242	.10	100			

Table 9. Pesticides detected in water, September 19-21, 1989
[Concentrations in micrograms per liter]

Pesticides	Concentration at indicated site: 2	3	6	7	8	9
Insecticides						
Diazinon	0.28	--	--	0.01	0.02	--
Parathion	.01	--	--	--	--	--
Herbicide						
2,4-D	.12	0.19	0.20	.11	.16	0.22

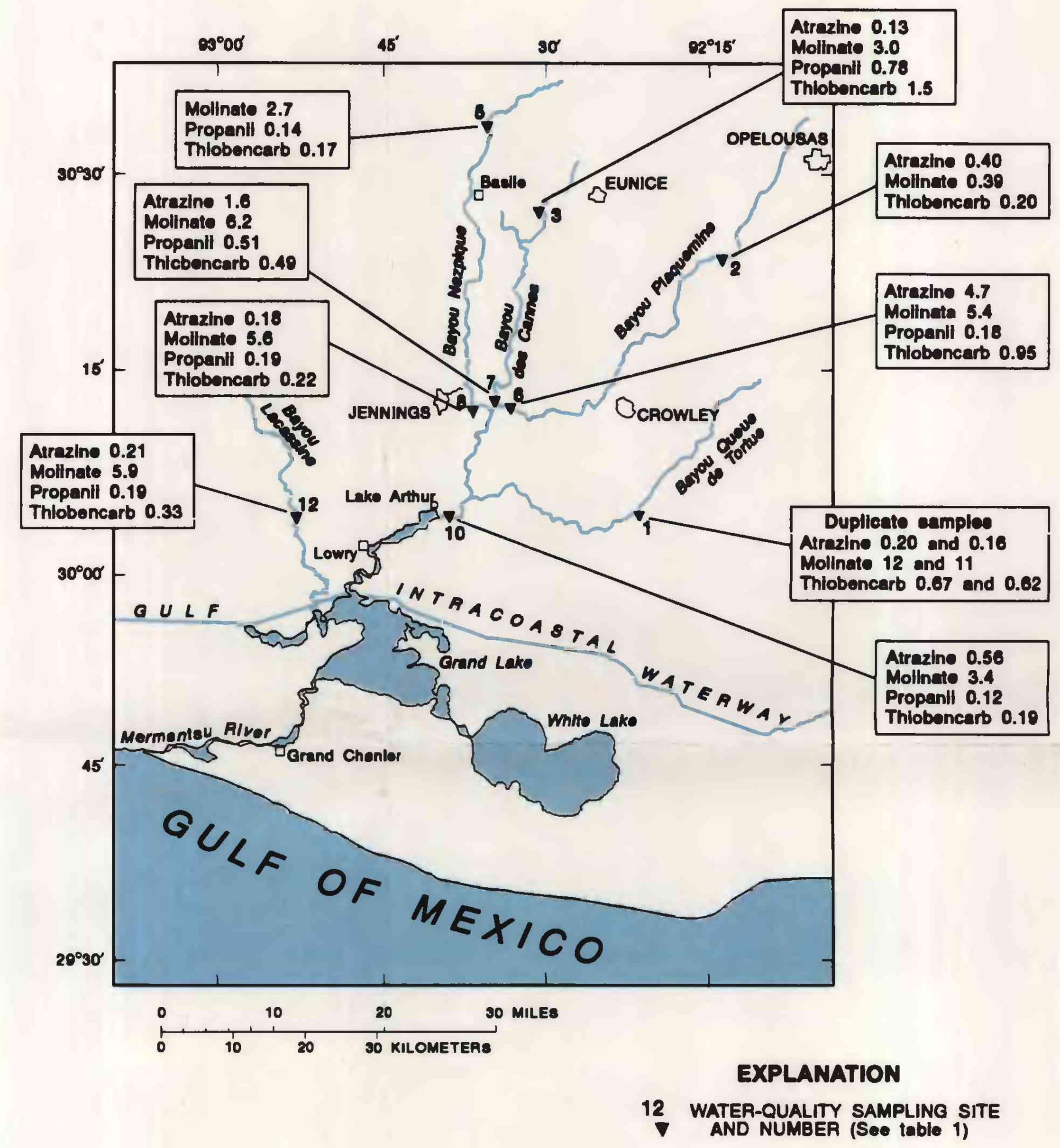
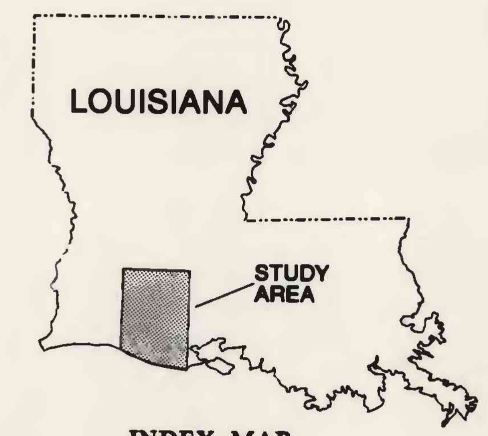


Figure 7. Concentrations of herbicides, in micrograms per liter, detected in water, May 16-17, 1990.



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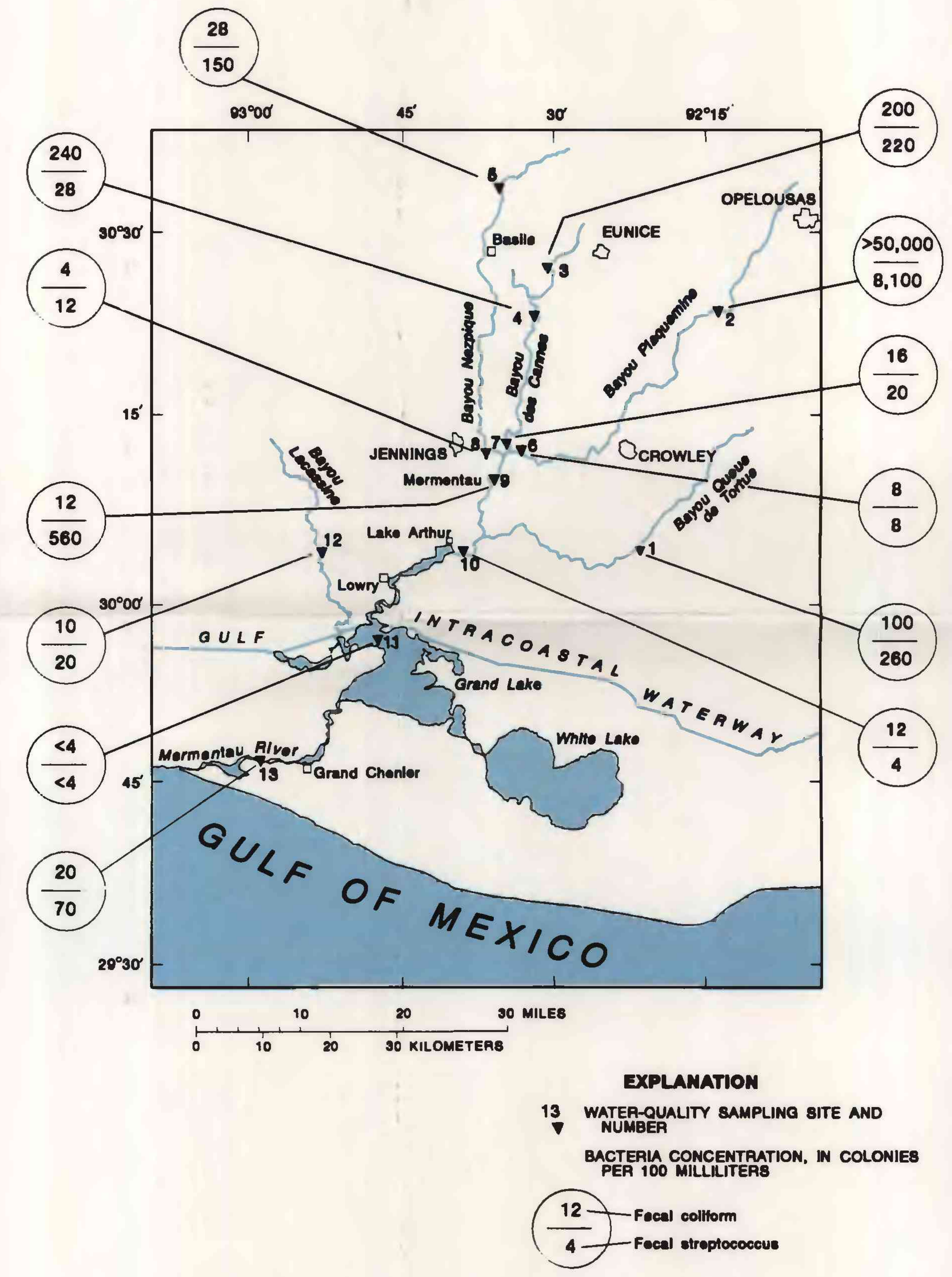

Figure 8. Distribution of fecal-bacteria concentrations, September 19-21, 1989.

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LOUISIANA HYDROLOGIC ATLAS MAP NO. 7:

WATER-QUALITY SURVEY OF THE MERMENTAU RIVER BASIN, 1989-90

By Dennis K. Demcheck
1994